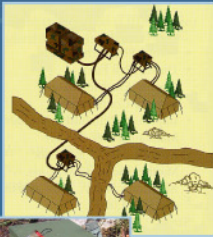


Concept Development (6.4-6.5)

Power Assessments

Next Generation PDISE



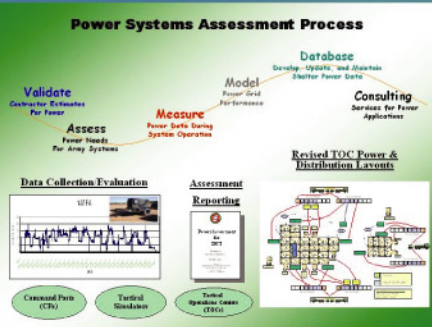
Capabilities of Interest

- Auto load shedding
- Phase balancing
- Auto paralleling
- No-break load transfer
- Datalogging



Prototype PDISE Concepts

Conducted and On-Going Power Assessments FY04 – FY05



1st Cavalry



3rd Infantry Division



US Army V CORPS



18th Airborne



Air Traffic Systems Command



Ground-Based Midcourse Defense Program Ballistic Missile Defense System Test Bed

Capabilities

S&T Experience

Electrical, Electromechanical
Mechanical, Structural Applied Science
Signature Suppression (Noise/IR/EMI)
Environmental (-25 F to 120 F)
Project Management / Procurement ACQ

Systems Assessment

Power Assessment
Power Distribution
Grid Layout Design

Fabrication

Drafting (Concept)
Machine Shop
Paint Shop
Proof of Concepts

Testing

Endurance
Electrical (MIL-STD-705)
Environmental (High/Low Temperature)
Data Acquisition

Engineering Data

Test Reporting
Technical Manuals
Training
Performance Specification Development

The Power Generation Branch Supports the Following Organizations	
PM-MEP	Power Assessments
	System Development / Demonstration : 5 – 60 kW
	Small Tactical Electric Power: 500 – 2000 W
	Advanced Medium-sized Mobile Power Sources
	TQG / DoD STD Life Cycle
	Congressional Plus Ups
	SBCT
DARPA	Stirling & Steam based Power Sources: 0.4–2.0 kW
SOCOM	Palm Power
PEO JPO-BD	Portable Shield
PM-TOC	Command Post Platform, 10 kW APU, APU / ECU
ONR	Technical Base Engineering Support
Night Vision	Camera Aided Monitoring Systems – 3 versions
NATICK	CBPS, SBIR Technical Support
DOT-FRA	Advanced Locomotive Power System

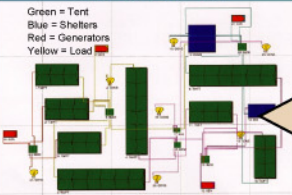
Power Generation Branch

Army Power Division



Automated Power Distribution Tools/Software

Computer Model



Phased Approach

Software for TOC Design

- 1) Upgrade to Windows 2000 Compatibility
- 2) Easier User Interface and Load Balancing
- 3) Will be Web-Enabled for Ease of Use



Mission Statement:

To conduct Research, Development and Engineering activities leading to the advancement of Power Generation Systems to support unique mission requirements

"Technology to the Warfighter Quicker"

FORT BELVOIR, VIRGINIA

← Concept Development (6.1-6.2) →

← Concept Development (6.4-6.5) →

Soldier Power 1-20 Watts

Hand Crank

Initial Objectives Achieved!

- Power : 10-20W
- Weight: 1 lb.
- Size : 9 cu. in.

Potential Users:

- Land Warrior, Special Forces, and Large Commercial Market

Technology:

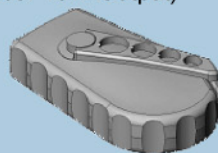
- State-Of-The Art Electromagnetics
- Sintered NeFeB Magnets
- Optimized Motor Constant
- Digital Power Management System

Features:

- Selectable Voltage Output Range
- User Feedback For Power Input, Output, Energy Output, etc.
- Indefinite Supply of Power
- High Efficiency 88% (17W Input / 15W Output)



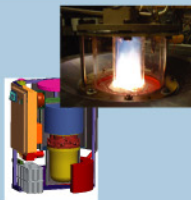
Finite
Element
Analysis



Future Force Power 0.5 kW - 2.0 kW (ATO IV.LG.2005.02)

Objective: To develop component technologies for power systems for increased mission duration while decreasing logistics burden at a system level

Goal: Tactical power systems that address the emerging military need for man-portable, JP-8 fuel burning power in the 500 to 2000 W range with periodic silent operating capability and co-generation capability.



< 2 kW Stirling
Engine Driven
System

Technologies of Interest:

- Stirling Power Systems
- Fuel Cell Power Systems
- Advanced Power Control and Conditioning

Advanced Research and Development Test and Evaluation

Small Tactical Electric Power 0.5 kW - 3.0 kW (STEP)

Objectives:

- To investigate / test / evaluate:-
- Commercial power sources
- Emerging power technologies and their integration with state of the art commercial technology

That address the emerging military need for man-portable, JP-8 fuel burning power in the 500 to 3000 W range with periodic silent operating capability.



< 1 kW Stirling Engine
Driven System



1 kW Fuel Cell System

Technologies of Interest:

- Stirling Power Systems
- Fuel Cell Power Systems
- Advanced Electromechanical Power Components/Systems

Portable Electric Power 0.5 kW - 3.0 kW

Micro Turbines

- High Power to Weight Ratio
- High Reliability
- Low Noise < 65 dBA
- Low Maintenance



Systems Development and Demonstration : 5 – 60 kW



Market Surveys

- Advanced COTs power generation components/systems
- Data Acquisition and Datalogging Equipment

10 kW Inverter Development

- Smaller/Lighter Alternative to Auxiliary Power Unit (APU)
- Powered by Under-Hood 400A Alternator

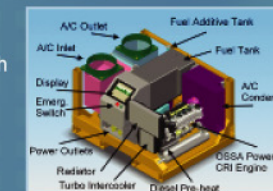


Wetstacking Kit Development

- Technology Transition from HBCU effort w/New Mexico State University
- Objective is to Eliminate Wetstacking at Low Loads Without Impacting Fuel Consumption
- Closed-Loop control of Combustion Temperature through Intake throttling

Integrated Environmental Control and Power System (ECAPS)

- Proof-of-Concept System Development
- Variable-Speed Engine
- Variable-Speed DC Motor-Driven Compressor
- Load Following Compressor vs. On/Off Approach
- Minimal Transient Loading



Advanced Variable Speed Generator Set

- Variable speed JP-8 fuel burning Gen Set

- Based on the results of Army S&T work
- High Speed Engine / PMG
- Power Electronic Controls & Conditioning
- Selectable Frequency (50/60/400 Hz)
- Selectable Voltage Connection (120/240/415 V AC)
- Advanced Materials: SiC & Composites
- Diagnostics / Prognostics
- Integrated Anti - Wet Stacking Device

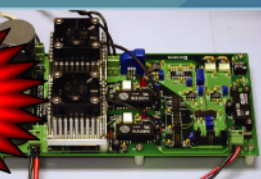
- HAEMP Protected



Power Electronics

High Efficiency 92% - 95%
Reduced Fuel Consumption
Load Sensing
Variable Speed Control
Minimized Wetstacking

Reduce
Total
Ownership
Costs



Advanced Power Electronic Subsystems

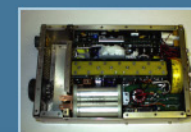
Tactical Inverter:

Uses DC power from any Military Vehicle based NATO slave receptacle and converts it to AC power

- Application: Power on the Move or Silent Watch
- System: Multiple, Modular, Parallelable Portable Boxes
- Output: 2.5 kW to 10 kW continuous power, 120 VAC, single phase, 60 Hz in multiple power increments of 2.5 kW



Tactical Vehicle
Inverter



Increased Mobility! Increased Survivability! Reduced Maintenance!